

Pistonless Pump Technology Demonstrator



University of Colorado
Boulder

FLOMETRICS

Problem Statement

- Pistonless pumps offer a potential advancement in space and rocket propellant transfer.
- A flight opportunity on SpaceShipTwo or a similar SRLV would provide relevant testing environments for this technology.
- Potential users of the matured technology include sRLV operators, NASA, in-space propulsion firms, and/or ECLSS fluid transfer.

Technology Development Team

- Dr. Ryan P. Starkey, University of Colorado Boulder: rstarkey@colorado.edu
- Funded in part by the Engineering Excellence Fund at the University of Colorado Boulder: <http://eef.colorado.edu/>
- In partnership with Flometrics, Inc: <http://www.flometrics.com/>

Proposed Flight Experiment

Experiment Readiness:

- Development of the pistonless pump test payload is underway, and should be flight-ready by Fall 2013.

Test Vehicles:

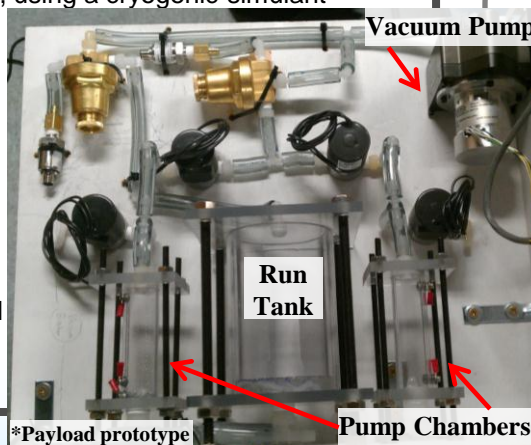
- To obtain a varied g-force testing environment with a large enough volume to hold the experiment apparatus, a sRLV flight is requested on Virgin Galactic's SpaceShipTwo or similar vehicle.

Test Environment:

- In 2009, a half-capability, low-fidelity pistonless pump system was flown on a NASA microgravity aircraft. This round of testing will feature a full-capacity version of a pistonless pump, flown at a variety of g-loads.

Test Apparatus Description:

- The flight test apparatus features a dual chamber pistonless pump, using a cryogenic simulant (vacuum boiling water) as the working fluid. This fluid is pressurized by vehicle cabin air and is operated below cabin pressure for inherent fluid containment and added safety.



Technology Maturation

- To advance the technology in TRL, the system must perform within specific performance bounds in the rocket boost and microgravity phases of sLRV flight.
- 95% of hardware construction is completed, and automation and data acquisition testing are underway to complete this payload.
- There is no deadline for the maturation of this technology, but the sooner this technology is demonstrated, the sooner it can provide benefit to NASA and commercial partners.

Objective of Proposed Experiment

- The experiment will measure output pressure, flow rate, and temperatures, and success will be measured on the output ranges.
- The data collected will characterize pistonless pump technology in a relevant environment. This will further the TRL and get the technology one step closer to commercial operation.